

CHEMICAL VAPOR DEPOSITION METHODS FOR MAKING POWDERS AND COATINGS, AND COATINGS MADE USING THESE METHODS

Abstract of the Disclosure

A modified chemical deposition method wherein the energy source and/or the hot gasses produced thereby are redirected is disclosed, as well as various coatings formed by this method. The redirecting of the energy, heat or combustion source and/or hot deposition gasses is accomplished by a jet of air, gas or liquid, or a combination thereof directed toward or near the combustion source, and/or by a vacuum source placed close to the combustion source. Multiple jets and/or vacuum sources can be used. The fluid jets may provide additional precursor solution in addition to the precursor solution provided through the primary CCVD nozzle or other material sources. By redirecting the energy source, a more uniform coating is achieved by vigorously mixing the deposition gasses, as well as distributing the gasses over a greater area of the substrate. This results in more uniform temperature and concentration profiles over the surface of the substrate. In addition, redirecting the energy source results in the activation temperature being maintained high enough to form the coating, while avoiding over-heating of the substrate. The methods disclosed are particularly useful for forming thin film, insulative, oxide coatings on the surface of conductive or superconductive wires. Conductors coated in this manner are extremely thin, but have high insulation breakdown voltages. When used in electromagnetic devices, a high degree of efficiency can be achieved. Metal oxide coatings for polymer food containers using this method are also disclosed. These coatings provide a decreased oxygen and water vapor transmission rate, thereby acting as an improved barrier layer. The improvement in these barrier layers increases the shelf life of food products stored in these containers. Oxide coatings on polymers, such as thin silica coatings on polycarbonate, provide abrasion resistant laminates useful as non-breakable windows. Re-direct technology facilitates the coating of interior surfaces, such as the interior walls of bottles and elongated tubes, where direct application of flame might be problematical. In addition, the redirect methods are useful for producing powders that can be collected for further processing.